2.3.10. Maximum Unambiguous Range

2.3.10.1. Purpose

The purpose of this test is to determine the maximum unambiguous range of the radar and its effects upon intercept tactics.

2.3.10.2. General

The radar theory section outlines the relationship between range ambiguities and radar PRF. Although the PRF is easily checked on the ground, it is worthwhile to perform a quick check for range ambiguities within the maximum detection envelope of the airplane while airborne, particularly for airplanes with multiple or staggered PRFs. Since range ambiguities tend to come into play at longer ranges, the test should be performed using the long range modes. Check the pulse, pulse doppler, and FM ranging modes only since the VS mode does not determine range. If no irregularities are found in the longer range modes, then the validity of the ground PRF checks for the other modes can be assumed.

Since the target must be acquired to check the range validity, a little creativity may be required to confirm contact with the correct radar target if range ambiguities actually exist. If an STT can be established, the target bearing and altitude can be used to identify the target. Heading and speed may be incorrect depending upon the method used for tracking. Altitude will also be affected since a simple geometrical relationship between antenna pointing angle and range is usually used to determine altitude; however, the altitude error should be small if the difference between the target and test altitudes is small. A quick call to the agency controlling the test area can be used to confirm that no other aircraft are along the same line of bearing and if they are, their altitude.

2.3.10.3. Instrumentation

Data cards and an optional voice recorder are required for this test.

2.3.10.4. Data Required

If a discrepancy of greater than 3 nm between radar range and air-to-air TACAN range is noted, record the radar and air-to-air TACAN derived target ranges every 2 nm of closure until the target and test airplane pass or "fly through". Record qualitative comments of the effects of ambiguous ranges (if any are found) during mission relatable intercepts.

2.3.10.5. Procedure

Following a maximum detection range data point, obtain an STT. If a range ambiguity is present, use the target bearing and altitude, as well as aid from the test area controlling agency to confirm the correct target is acquired. If a range difference of greater than 3 nm between the air-to-air TACAN and the radar is noted, begin recording the radar and TACAN derived ranges every 2 nm of closure. Continue taking data until fly through. Repeat for all long range, ranging modes.

2.3.10.6. Data Analysis and Presentation

Plot the radar derived range versus the air-to-air TACAN derived target range. If an ambiguity is present, a sawtooth pattern will be evident. The pattern will be repetitive and symmetrical if the PRF is constant. The approximate PRF can be derived from the plot using the following relationship:

$$PRF = \frac{(C)}{(R_{rep})} \quad (11)$$

R_{rep} = *the TACAN derived range from the beginning of the peak of the sawtooth*

If the PRF is staggered or random, a symmetrical, repeatable pattern may not be evident but the sawtooth shape should still be seen. If an ambiguity is found, relate the poor range information to its effect upon intercept and attack tactics. If target heading, speed or altitude are affected, relate the quality of this data to the same mission relatable intercept tactics.

2.3.10.7. Data Cards

A sample data card is provided as card 14.

50

CARD NUMBER ___ TIME ____ PRIORITY L/M/H

MAXIMUM UNAMBIGUOUS RANGE

[FOLLOWING THE MAX DETECTION RANGE TEST, ESTABLISH STT. USE THE TARGET'S BEARING, ALTITUDE AND ADVISORY CALLS TO CONFIRM THE CORRECT TARGET IS ACQUIRED. IF THE TACAN AND RADAR RANGES ARE DIFFERENT BY GREATER THAN 3 NM, TAKE BOTH RANGES EVERY 2 NM. NOTE THE QUALITY OF THE RADAR DERIVED COURSES, SPEEDS AND ALTITUDES.]

TACAN	RADAR	TACAN	RADAR	TACAN	RADAR	TACAN	RADAR

[IF AMBIGUITIES ARE FOUND, QUALITATIVELY EVALUATE THE EFFECTS OF ERRONEOUS RADAR RANGES AND TARGET DERIVED COURSE, SPEED AND ALTITUDE ON TACTICS DURING MISSION RELATABLE INTERCEPTS.]

EFFECTS:

Card 14: Maximum Unambiguous Range Data Card